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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

TAKE-OFF MAN (PAPER GOODS) 8-42.01

B-331 or S-84

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EDUCATION & WELFARE
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U. S. Employment Service in
Cooperation with
Wisconsin State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
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STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR TAKE-OFF MAN (PAPER GOODS) 8-42.01

B-331 or S-84

Summary

The General Aptitude Test Battery, B-1001, was administered for a longitudinal design test development study to 52 male applicants who were subsequently hired by the Marathon Corporation, Menasha, Wisconsin, for the occupation of Take-Off Man (paper goods) 8-42.01 during the period of March 1950 through February 1955. The criterion consisted of supervisory ratings which were expressed in broad categories. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P-Form Perception and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Take-Off Man (paper goods) 8-42.01 - B-331 or S-84

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Take-Off Man (paper goods) 8-42.01.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-331 or S-84

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	95	P	Part 5 Part 7	95
M	CB-1-M CB-1-N	90	M	Part 9 Part 10	85

Effectiveness of Norms

The data in Table IV indicate that 8 of the 14 poor workers, or 57 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 57 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 37 of the 43 workers who made qualifying test scores, or 86 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Take-Off Man (paper goods) 8-42.01.

II. Sample

The General Aptitude Test Battery, B-1001, was administered during the period of March 1950 through February 1955 to 56 male applicants who were subsequently employed as Take-Off Man (paper goods) 8-42.01 at the Marathon Corporation, Menasha, Wisconsin. All of these men were hired without regard to test scores. Four of the applicants were eliminated from the sample for failure to report for the apparatus testing. This resulted in a final sample of 52 workers.

One month of experience was considered to be the average length of time for a valid job performance rating to be obtained. All of the men in the sample were considered to be experienced workers. Although there were no age or education requirements, the company preferred to hire workers between the ages of 18 and 25 who had at least some high school education. However, these preferred requirements were not adhered to in a tight labor market. Hiring was done by means of a personal interview and a check of references. Each employee was required to pass a physical examination and a color vision test which was administered by the company.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations (corrected for broad categories) with the criterion for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) for Age, Education, and Experience

Take-Off Man (paper goods) 8-42.01
N = 52

	M	σ	Range	$_{c}r$
Age (years)	24.7	4.5	19-39	.113
Education (years)	11.5	1.4	6-14	.267
Experience (months)	35.6	14.0	25-75	.299*

*Significant at the .05 level

The correlations between age and education and the criterion are not significant. However, the correlation between experience and the criterion is significant at the .05 level. The criterion was not corrected to nullify the influence of experience because the ratings were expressed in broad categories and the statistical correction technique used for this purpose was not applicable. The data indicate that this sample is suitable for test development purposes with respect to age, education, and experience.

III. Job Description

Job Title: Take-Off Man (paper goods) 8-42.01

Job Summary: Removes glued and folded cartons at discharge end of gluing machine, inspects cartons for defects, discards defective cartons and packs good cartons in large shipping containers. Seals and applies shipping labels to filled containers.

Work Performed: Removes and inspects cartons: Removes groups of 25 or 50 machine-counted glued cartons from discharge end of gluing machine, jogs cartons into alignment, checks approximate count by holding cartons up to measuring board and inserts counted group of cartons into one of several compartments of wooden rack. Frequently inspects cartons coming off machine for improper gluing, de-waxed areas, off-register scoring cracks, mixed or dirty cartons, ink smears, off colors and tears. Notifies feeder to shut down machine where defects are serious. Discards defective cartons and replaces with good ones. Pulls samples as requested. Assists feeder to straighten out machine jams. Makes out machine report for each order indicating shift, date, number of cartons run and workers' names.

Packs cartons: Packs glued and counted cartons in cardboard shipping containers by unfolding container, placing cardboard divider in bottom, removing cartons from rack compartment and packing in containers in 25's or 50's in proper manner to insure pressure for drying with glue on cartons. Places necessary dividers between layers of cartons and on top of filled containers. Pushes filled containers to sealer.

Seals containers: Seals filled containers by pasting strip of gummed tape across top of carton using tape machine. Wets and applies proper shipping label to container and stacks containers on floor skids for removal to warehouse.

IV. Experimental Battery

All of the tests of the GATB, B-1001, were administered to the sample group.

V. Criterion

The criterion data were collected during the period of June 1 through June 3, 1955. The criterion consisted of supervisory ratings made by the plant supervisor, the three shift foremen and one assistant foreman. Each rater divided the workers under his supervision into three categories, above average,

average, and below average, and also ranked the workers in the order of ability. This resulted in a varying number of ratings for each worker. For the final composite broad category criterion, each worker was placed in the category of the mode of his ratings. For statistical purposes these broad category ratings were converted to quantitative scores. The above average group with 14 workers, the average group with 24 workers and the below average group with 14 workers received scores of 62, 50, and 38, respectively.

VI. Statistical and Qualitative Analysis

Table III shows the means, standard deviations, and Pearson product-moment correlations (corrected for broad categories) with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) for the Aptitudes of the GATB

Take-Off Man (paper goods) 8-42.01

N = 52

Aptitudes	M	σ	$_{c}r$
G-Intelligence	111.5	16.9	.354**
V-Verbal Aptitude	99.9	14.6	.250
N-Numerical Aptitude	110.3	16.2	.406**
S-Spatial Aptitude	118.1	18.3	.202
P-Form Perception	112.8	18.2	.320*
Q-Clerical Perception	98.5	15.9	.387**
A-Aiming	105.9	14.6	.526**
T-Motor Speed	99.4	13.2	.386**
F-Finger Dexterity	105.6	19.4	.041
M-Manual Dexterity	109.4	16.5	.646**

**Significant at the .01 level
*Significant at the .05 level

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Form Perception (P) - required to detect and recognize defects such as improper gluing, de-waxed areas, off-register scoring cracks and tears.

Manual Dexterity (M) - required to pick up, handle and pack cartons rapidly.

The highest mean scores were obtained in descending order of magnitude for Aptitudes S, P, G, N, and M, respectively. All of the aptitudes have standard deviations of less than 20, with Aptitude T exhibiting the smallest standard deviation.

When N=62, correlations of .364 and .273 are significant at the .01 level and the .05 level, respectively. Aptitudes G, N, Q, A, T, and M correlate significantly with the criterion at the .01 level and Aptitude P correlates significantly with the criterion at the .05 level of confidence.

Aptitudes S, P, A, and M were considered for inclusion in the test norms on the basis of the quantitative and qualitative factors cited above. Aptitudes P and M appeared to be important in terms of the job analysis data, showed relatively high mean scores and both aptitudes showed significant correlations with the criterion. Aptitude S showed the highest mean score for this sample and Aptitude A showed significant correlation with the criterion at the .01 level of confidence. Tetrachoric correlations with the criterion were computed for several sets of trial norms consisting of various combinations of Aptitudes S, P, A, and M and appropriate cutting scores. However, the addition of Aptitude S or A tended to lower the selective efficiency of norms which included Aptitudes P and M. Therefore, Aptitudes S and A were excluded from the final test norms which included Aptitudes P and M. The cutting score for Aptitude P was set at one standard deviation unit below the mean and rounded to the nearest five-point score level. The cutting score for Aptitude M was set at one standard deviation unit below the mean rounded to the nearest five-point score level and adjusted to the next lower five-point score level. Setting cutting scores at these levels yielded the best selective efficiency for the norms and resulted in critical scores of 95 and 90 for Aptitudes P and M, respectively.

Although there was some statistical evidence of significance for Aptitudes G, N, Q, and T, these aptitudes were omitted from the test norms because they did not appear to be important on the basis of job analysis data.

VII. Predictive Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized with those workers rated as "above average," and "average," placed in the high criterion group, and with those rated as "below average," placed in the low criterion group. This placed 14 of the 52 workers, or 27 percent of the sample, in the low criterion group.

Table IV shows the relationship between the dichotomized criterion and test norms consisting of Aptitudes P and M with critical scores of 95 and 90, respectively, and the criterion for Take-Off Man (paper goods) 8-42.01. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes P and M with Critical Scores of 95 and 90, Respectively and the Criterion for Take-Off Man (paper goods) 8-42.01

N = 52

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	1	37	38
Poor Workers	8	6	14
Total	9	43	52

r_{tet} = .92 X^2 = 17.603

$\sigma_{r_{tet}}$ = .28 P/2 $<$ .0005

The data in the above table indicate a high and significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes P and M with minimum scores of 95 and 90, respectively, are recommended as B-1001 norms for the occupation of Take-Off Man (paper goods) 8-42.01. The equivalent B-1002 norms consist of P-95 and M-85.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include two aptitudes, only those occupational aptitude patterns which include the same two aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. The only one of the existing 17 occupational aptitude patterns which meets these criteria for this study is OAP-15, which consists of P-85, T-80, and M-85 for B-1001. The selective efficiency of OAP-15 for this sample was determined by means of the tetrachoric correlation technique. The relationship between OAP-15 and the criterion for this sample was not significant. Therefore, none of the existing 17 occupational aptitude patterns is recommended for Take-Off Man (paper goods) 8-42.01. However, the data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.